Chapter 9

Debt Valuation and Interest Rates

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Overview

1. Overview of Corporate Debt
   Identify the key features of bonds and describe the difference between private and public debt markets.

2. Valuing Corporate Debt
   Calculate the value of a bond and relate it to the yield to maturity on the bond.

3. Bond Valuation: Four Key Relationships
   Describe the four key bond valuation relationships.

4. Types of Bonds: Identify the major types of corporate bonds.

5. Determinants of Interest Rates
   Explain the effects of inflation on interest rates.
9.1 Corporate Debt

- There are two main sources of borrowing for a corporation:
  1. Loan from a financial institution (known as private debt)
  2. Bonds (known as public debt since they can be traded in public financial markets)

- Smaller firms choose to raise money from banks in the form of loans because of the high costs associated with issuing bonds.

- Larger firms generally raise money from banks for short-term needs and depend on the bond market for long-term financing needs.
In the private financial market, loans are typically floating rate loans i.e. the interest rate is periodically adjusted based on a specific benchmark rate.

The most popular benchmark rate is the London Interbank Offered Rate (LIBOR), which is the daily interest rate that is based on the interest rates at which banks offer to lend in the London wholesale or interbank market.

Interbank market is the market where banks loan each other money.
A typical floating rate loan will specify the following:

- The *spread or margin* between the loan rate and the benchmark rate expressed as basis points.
- A maximum and a minimum annual rate, to which the rate can adjust, called the *ceiling and floor*.
- A *maturity date*
- *Collateral*

For example, a corporation may get a 1-year loan with a rate of 300 basis points (or 3%) over LIBOR with a ceiling of 11% and a floor of 4%.
### Table 9.1 Types of Bank Debt

Bank loans are typically classified in one of two ways: (i) by the intended use of the loan, e.g., working capital or transaction loans, and (ii) by whether the loan is secured by collateral or not.

#### (Panel A) Types of Bank Loans—classified by Intended Use

| Working capital loans | Typically, these loans set up a line of credit based on an open-ended credit agreement whereby the firm has prior approval to borrow up to a set limit. This type of credit agreement is similar to that of a personal credit card that provides a line of credit up to an agreed-upon limit. The credit is then used to provide cash needed to support the firm’s day-to-day business needs. |
| Transaction loans      | Firms use this type of loan to finance a specific asset. These loans typically call for installment payments designed to repay the principal amount of the loan, plus interest, with fixed monthly or annual payments. Home mortgage and automobile loans are examples of transaction loans that require installment payments. |

#### (Panel B) Types of Bank Loans—classified by the Collateral Used to Secure the Loan

| Secured debt          | This type of debt acts as a promise to pay that is backed by granting the lender an interest in a specific piece of property, known as collateral. The property used to secure the loan can include virtually any tangible business asset and could include accounts receivable, inventory, plant and equipment, and real estate. |
| Unsecured debt        | A promise to pay that is not supported by collateral so that the lender relies upon the creditworthiness and reputation of the borrower to repay the debt when due. |
Borrowing Money in the Public Financial Market

- Firms also raise money by selling debt securities to individual investors and financial institutions such as mutual funds.

- In order to sell debt securities to the public, the issuing firm must meet the legal requirements as specified by the securities laws.

- **Corporate bond** is a debt security issued by corporation that has promised future payments and a maturity date.

- If the firm fails to pay the promised future payments of interest and principal, the bond trustee can classify the firm as insolvent and force the firm into bankruptcy.
The basic features of a bond include the following:

- Bond Indenture
- Claims on Assets and Income
- Par or Face Value
- Coupon Interest Rate
- Maturity and Repayment of Principal
- Call Provision and Conversion Features
### Table 9.2  Bond Terminology

Understanding the terminology used to describe bonds is essential to gaining a full understanding of the world of corporate bonds.

<table>
<thead>
<tr>
<th><strong>Indenture</strong></th>
<th>The legal agreement between the firm issuing the bonds and the bond trustee who represents the bondholders. It lists the specific terms of the loan agreement, including a description of the bonds, the rights of the bondholders, the rights of the issuing firm, and the responsibilities of the trustee.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Priority of claim on assets and income</strong></td>
<td>In the case of insolvency, claims of debt in general, including bonds, are honored before those of both common stock and preferred stock. In addition, interest payments hold priority over dividend payments for common and preferred stock.</td>
</tr>
<tr>
<td><strong>Par value</strong></td>
<td>The par value of a bond, also known as its face value, is the principal that must be repaid to the bondholder at maturity. In general, corporate bonds are issued with par values in increments of $1,000. Also, when bond prices are quoted in the financial press, prices are generally expressed as a percentage of the bond’s par value.</td>
</tr>
<tr>
<td><strong>Maturity and repayment of principal</strong></td>
<td>The maturity date refers to the date on which the bond issuer must repay the principal or par value to the bondholder.</td>
</tr>
<tr>
<td><strong>Coupon interest rate</strong></td>
<td>The coupon rate on a bond indicates the percentage of the par value of the bond that will be paid out annually in the form of interest.</td>
</tr>
<tr>
<td><strong>Current yield</strong></td>
<td>The current yield on a bond refers to the ratio of the annual interest payment to the bond’s current market price. If, for example, we have a bond with an 8 percent coupon interest rate, a par value of $1,000, and a market price of $700, it would have a current yield of 11.4 percent calculated as follows:</td>
</tr>
</tbody>
</table>
|  | \[
| \text{Current Yield} &= \frac{\text{Annual Interest Payment}}{\text{Current Market Price of the Bond}} \\
| &= \frac{0.08 \times \$1000}{\$700} \\
| &= \frac{80}{700} = 0.114 \text{ or } 11.4\% \quad (9-1)
|  |
| **Call provision**      | The call provision provides the issuer of the bond with the right to redeem or retire a bond before it matures. |
| **Conversion feature**  | In addition, some bonds have a conversion feature that allows bondholders to convert their bonds into a set number of shares of common stock. |
Bond Ratings and Default Risk

- Bond ratings indicate the default risk, i.e., the probability that the firm will fail to make the promised payments.

- Bond ratings affect the rate of return that lenders require of the firm and the firm’s cost of borrowing.

- The lower the bond rating, the higher the risk of default and higher the rate of return demanded in the capital market.

- Bond ratings are provided by three rating agencies – Moody’s, Standard & Poor’s, and Fitch Investor Services.
Table 9.3  Interpreting Bond Ratings

Ratings are intended to reflect the likelihood of default by the issuing firm in the future.

<table>
<thead>
<tr>
<th>Bond Rating Category</th>
<th>Standard &amp; Poor’s</th>
<th>Moody’s</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Investment Grade:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prime or highest strong</td>
<td>AAA</td>
<td>Aaa</td>
<td>Highest quality, extremely strong capacity to pay.</td>
</tr>
<tr>
<td>High quality</td>
<td>AA</td>
<td>Aa</td>
<td>Very strong capacity to pay.</td>
</tr>
<tr>
<td>Upper medium</td>
<td>A</td>
<td>A-1, A</td>
<td>Upper medium quality. Strong capacity to pay.</td>
</tr>
<tr>
<td>Medium</td>
<td>BBB</td>
<td>Baa-1, Baa</td>
<td>Lower medium quality. Changing circumstances could impact the firm’s ability to pay.</td>
</tr>
<tr>
<td><strong>Not Investment Grade:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Speculative</td>
<td>BB</td>
<td>Ba</td>
<td>Speculative elements, faces uncertainties.</td>
</tr>
<tr>
<td>Highly speculative</td>
<td>B, CCC, CC</td>
<td>B, Caa, Ca</td>
<td>Extremely speculative and highly vulnerable to nonpayment.</td>
</tr>
<tr>
<td>Default</td>
<td>D</td>
<td>C</td>
<td>Income bond, doesn’t pay interest.</td>
</tr>
</tbody>
</table>
9.2 Valuing Corporate Debt

- The value of corporate debt is equal to the present value of the contractually promised principal and interest payments (the cash flows) discounted back to the present using the market’s required yield.
Step-by-Step: Valuing Bonds by Discounting Future Cash Flows

- **Step 1**: Determine the amount and timing of bondholder cash flows. The total cash flows equal the promised interest payments and principal payment.

- **Annual Interest** = Par value × coupon rate

- **Example 9.1**: The annual interest for a bond with coupon interest rate of 7% and a par value of $1,000 is equal to $70, (.07 × $1,000 = $70).

- Some bonds have semi-annual payments.
Step-by-Step: Valuing Bonds by Discounting Future Cash Flows

- **Step 2**: Estimate the appropriate discount rate on a similar risk bond. Discount rate is the return the bond will yield if it is held to maturity and all bond payments are made.
  - Discount rate can be either calculated or obtained from various sources (such as Yahoo! Finance).

- **Step 3**: Calculate the present value of the bond’s interest and principal payments from Step 1 using the discount rate estimated in step 2.
Yield to Maturity (YTM)

- We can think of YTM as the discount rate that makes the present value of the bond’s promised interest and principal equal to the bond’s observed market price.

\[
\text{Bond Price} = \frac{\text{Interest}_{\text{year } 1}}{(1 + \text{YTM})^1} + \frac{\text{Interest}_{\text{year } 2}}{(1 + \text{YTM})^2} + \frac{\text{Interest}_{\text{year } 3}}{(1 + \text{YTM})^3} + \frac{\text{Interest}_{\text{year } 4}}{(1 + \text{YTM})^4} + \frac{\text{Interest}_{\text{year } 5}}{(1 + \text{YTM})^5} + \frac{\text{Principal}}{(1 + \text{YTM})^5}
\]

- You can compute YTM using excel or a financial calculator.
Market yield to maturity is regularly reported by a number of investor services and is quoted in terms of credit spreads or spreads to Treasury bonds.

Table 9-4 contains some examples of yield spreads.

The spread values in table 9-4 represent basis points over a US Treasury security of the same maturity as the corporate bond. For example, a 30-year Ba1/BB+ corporate bond has a spread of 275 basis points over a similar 30-year US Treasury bond.

Thus, this corporate bond should earn 2.75% over the 4.56% earned on treasury yield or 7.31%.
Table 9.4  Corporate Bond Spread Tables

Corporate bonds offer different yields to maturity for different maturities and different default risks. The following data reports the variation in yields to maturity for bonds across a wide range of default rating categories and terms to maturity. The body of the table is reported in basis points or 1/100th of one percent. To get the yield to maturity for a particular bond rating and term to maturity, simply add the basis points in the spread table to the U.S. Treasury security with similar maturity. This sample data is for March 1, 2006. Spreads fluctuate daily.

<table>
<thead>
<tr>
<th>Rating</th>
<th>1 yr</th>
<th>2 yr</th>
<th>3 yr</th>
<th>5 yr</th>
<th>7 yr</th>
<th>10 yr</th>
<th>30 yr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aaa/AAA</td>
<td>14</td>
<td>16</td>
<td>27</td>
<td>40</td>
<td>56</td>
<td>68</td>
<td>90</td>
</tr>
<tr>
<td>Aa1/AA+</td>
<td>22</td>
<td>30</td>
<td>31</td>
<td>48</td>
<td>64</td>
<td>77</td>
<td>99</td>
</tr>
<tr>
<td>Aa2/AA</td>
<td>24</td>
<td>37</td>
<td>39</td>
<td>54</td>
<td>67</td>
<td>80</td>
<td>103</td>
</tr>
<tr>
<td>Aa3/AA−</td>
<td>25</td>
<td>39</td>
<td>40</td>
<td>58</td>
<td>71</td>
<td>81</td>
<td>109</td>
</tr>
<tr>
<td>A1/A+</td>
<td>43</td>
<td>48</td>
<td>52</td>
<td>65</td>
<td>79</td>
<td>93</td>
<td>117</td>
</tr>
<tr>
<td>A2/A</td>
<td>46</td>
<td>51</td>
<td>54</td>
<td>67</td>
<td>81</td>
<td>95</td>
<td>121</td>
</tr>
<tr>
<td>A3/A−</td>
<td>50</td>
<td>54</td>
<td>57</td>
<td>72</td>
<td>84</td>
<td>98</td>
<td>124</td>
</tr>
<tr>
<td>Baa1/BBB+</td>
<td>62</td>
<td>72</td>
<td>80</td>
<td>92</td>
<td>121</td>
<td>141</td>
<td>170</td>
</tr>
<tr>
<td>Baa2/BBB</td>
<td>65</td>
<td>80</td>
<td>88</td>
<td>97</td>
<td>128</td>
<td>151</td>
<td>177</td>
</tr>
<tr>
<td>Baa3/BBB−</td>
<td>72</td>
<td>85</td>
<td>90</td>
<td>102</td>
<td>134</td>
<td>159</td>
<td>183</td>
</tr>
<tr>
<td>Ba1/BB+</td>
<td>185</td>
<td>195</td>
<td>205</td>
<td>215</td>
<td>235</td>
<td>255</td>
<td>275</td>
</tr>
<tr>
<td>Ba2/BB</td>
<td>195</td>
<td>205</td>
<td>215</td>
<td>225</td>
<td>245</td>
<td>265</td>
<td>285</td>
</tr>
<tr>
<td>Ba3/BB−</td>
<td>205</td>
<td>215</td>
<td>225</td>
<td>235</td>
<td>255</td>
<td>275</td>
<td>295</td>
</tr>
<tr>
<td>B1/B+</td>
<td>265</td>
<td>275</td>
<td>285</td>
<td>315</td>
<td>355</td>
<td>395</td>
<td>445</td>
</tr>
<tr>
<td>B2/B</td>
<td>275</td>
<td>285</td>
<td>295</td>
<td>325</td>
<td>365</td>
<td>405</td>
<td>455</td>
</tr>
<tr>
<td>B3/B−</td>
<td>285</td>
<td>295</td>
<td>305</td>
<td>335</td>
<td>375</td>
<td>415</td>
<td>465</td>
</tr>
<tr>
<td>Caa/CCC+</td>
<td>450</td>
<td>460</td>
<td>470</td>
<td>495</td>
<td>505</td>
<td>515</td>
<td>545</td>
</tr>
<tr>
<td>US Treasury Yield</td>
<td>4.74%</td>
<td>4.71%</td>
<td>4.68%</td>
<td>4.63%</td>
<td>4.60%</td>
<td>5.90%</td>
<td>4.56%</td>
</tr>
</tbody>
</table>

Valuing a Bond Issue

Consider a $1,000 par value bond issued by AT&T (T) with a maturity date of 2026 and a stated coupon rate of 8.5%. On January 1, 2007, the bond had 20 years left to maturity, and the market’s required yield to maturity for similar rated debt was 7.5%. If the market’s required yield to maturity on a comparable risk bond is 7.5%, what is the value of the bond?
A $1000 par bond with 8.5% coupon rate pays $1000 \times 8.5\% = $85 each year as a coupon payment. If the coupon is paid annually, this payment will last for 20 years as an annuity.

At the end of the 20 year, we also get the $1,000 principal payment.

The bond value is the present value of the 20 coupon payments and the principal.

\[ PV = 85 \times \left( \frac{1 - 1.075^{-20}}{0.075} \right) + \frac{1000}{1.075^{20}} \]

\[ = 866.53 + 235.41 = 1101.94 \]
Checkpoint 9.3: *Check Yourself*

Calculate the present value of the AT&T bond should the yield to maturity for comparable risk bonds rise to 9% (holding all other things equal).

- \[ PV = 85\times((1-1.09^{-20})/0.09) + 1000/1.09^{20} \]
  
  \[ = 775.93+178.43 = 954.36 \]

- The value of AT&T bond falls to $954.36 when the yield to maturity for comparable risk bond rises to 9%. The bonds are now trading at a discount as the coupon rate on AT&T bonds is lower than the market yield.
Semiannual Interest Payments

- Corporate bonds typically pay interest to bondholders semiannually. We can adapt Equation (9-2a) from annual to semiannual payments as follows:

\[
\text{Beta Value (semi-annual payments)} = \left( \frac{\text{Interest}}{2} \right) \left[ \frac{1}{1 + \frac{\text{YTM}_{\text{Market}}}{2}} \right]^{2n} + \text{Principal} \left[ \frac{1}{1 + \frac{\text{YTM}_{\text{Market}}}{2}} \right]^{2n}
\]

- If the AT&T bond has semi-annual coupon payment, each payment would be \(\frac{85}{2}=\$42.5\) for 40 payments.
  - PV = \(42.5\times((1-1.0375^{-40})/0.0375) + 1000/1.0375^{40}=1102.75\)
  - PV = \(42.5\times((1-1.045^{-40})/0.045) + 1000/1.045^{40}=954.00\)
  - The values are very close to the annual compounding case.
9.3 Bond Valuation: Four Key Relationships

- **First Relationship** The value of bond is inversely related to changes in the yield to maturity.

<table>
<thead>
<tr>
<th></th>
<th>YTM = 12%</th>
<th>YTM rises to 15%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Par value</strong></td>
<td>$1,000</td>
<td>$1,000</td>
</tr>
<tr>
<td><strong>Coupon rate</strong></td>
<td>12%</td>
<td>12%</td>
</tr>
<tr>
<td><strong>Maturity date</strong></td>
<td>5 years</td>
<td>5 years</td>
</tr>
<tr>
<td><strong>Bond Value</strong></td>
<td>$1,000</td>
<td>$899.44</td>
</tr>
</tbody>
</table>

Bond Value Drops
The value of bond is inversely related to the yield to maturity.

Figure 9.1
Bond Value and the Market’s Required Yield to Maturity (5-Year Bond, 12% Coupon Rate)
Bond prices and yields to maturity vary inversely. Since principal and interest payments are fixed, the price of the bond must adjust such that the bond yields the market’s current yield to maturity. For example, if the market yield to maturity were to increase from 12% to 15%, the price of the bond would have to fall from $1,000 to $899 in order for an investor who bought the bond today to earn 15%.
Bond Valuation: Four Key Relationships

- **Second Relationship**: The market value of a bond will be less than its par value if the yield to maturity is above the coupon interest rate and will be valued above par value if the yield to maturity is below the coupon interest rate.

- When a bond can be bought for less than its par value, it is called **discount bond**. For example, buying a $1,000 par value bond for $950.

- When a bond can be bought for more than its par value, it is called **premium bond**. For example, buying a $1,000 par value bond for $1,110.
Third Relationship As the maturity date approaches, the market value of a bond approaches its par value.

Regardless of whether the bond was trading at a discount or at a premium, the price of bond will converge towards par value as the maturity date approaches.

Fourth Relationship Long term bonds have greater interest rate risk than short-term bonds.

While all bonds are affected by a change in interest rates, long-term bonds are exposed to greater volatility as interest rates change.
Figure 9.2
Value of a 12-Percent Coupon Bond during the Life of the Bond
As a bond approaches its maturity, the price of the bond approaches the principal or par value of the bond.
9.4 Types of Bonds

- Table 9-7 contains a listing of major types of long-term debt securities that are sold in the public financial market.

- The differences among the various types of bond are based on the following bond attributes:
  1. Secured versus Unsecured,
  2. Priority of claim,
  3. Initial offering market,
  4. Abnormal risk,
  5. Coupon level,
  6. Amortizing or non-amortizing, and
  7. Convertibility.
Types of Bonds

① Secured versus Unsecured

- **Secured bonds** have specific assets pledged to support repayment of the bond.
- Unsecured bond are referred to as **debentures**.
- Bonds secured by lien on real property is called a **mortgage bond**.

② Priority of Claim

- The priority of claim refers to the order of repayment when the firm’s assets are distributed, as in the case of liquidation.
- Secured bonds are paid first followed by debentures; Among debentures, subordinated debentures have lower priority than secured debt and unsubordinated debentures.
Types of Bonds

3 Initial Offering Market
- Bonds are classified by where they were originally issued (in the domestic bond market or not).
- For example, Eurobonds are issued in a foreign country but are denominated in domestic currency. For example, a US corporation issuing bonds in Germany in US dollars.

4 Abnormal Risk
- Junk, or high-yield, bonds have a below-investment grade bond rating. These bonds have a high risk of default as the firms that issued these bonds are facing severe financial problems.
Types of Bonds

5. Coupon Level
   - Bonds with a zero or very low coupon are called zero coupon bonds.
   - Par bond: coupon level is close to ytm so that the bond can be sold at par.

6. Amortizing or Non-Amortizing
   - The payments from amortizing bonds, like a home mortgage, include both the interest and principal.
   - The payments from a non-amortizing bonds include only interest. At maturity, the bonds repay the par value of bond.

7. Convertibility
   - Convertible bonds are debt securities that can be converted into a firm’s stock at a pre-specified price.
<table>
<thead>
<tr>
<th>Types of Corporate Bonds</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Debentures</strong> Any form of unsecured long-term debt. Because they are unsecured, the earning ability of the issuing corporation is of great concern to the bondholder. They are riskier than secured bonds and as a result must provide investors with a higher yield than secured bonds provide. Often, the issuing firm attempts to provide some protection to the holder of the bond by prohibiting the firm from issuing more secured long-term debt that would further tie up the firm’s assets and leave the bondholders less protected. To the issuing firm, the major advantage of debentures is that no property has to be secured by them. This allows the firm to issue debt and still preserve some future borrowing power.</td>
</tr>
<tr>
<td><strong>Subordinated debentures</strong> The claims of the subordinated debentures are honored only after the claims of secured debt and unsubordinated debentures have been satisfied.</td>
</tr>
<tr>
<td><strong>Mortgage bonds</strong> Bonds secured by a lien on real property. Typically, the value of the real property is greater than the amount of the bonds issued. This provides the mortgage bondholders with a margin of safety in the event the market value of the secured property declines. In the case of foreclosure the bondholders get the proceeds from the sale of the secured property. If the proceeds from this sale do not cover the bonds, the bondholders become general creditors, similar to debenture bondholders, for the unpaid portion of the debt.</td>
</tr>
<tr>
<td><strong>Eurobonds</strong> Bonds issued in a country different from the one in whose currency the bond is denominated. For example, a bond that is issued in Europe or in Asia by an American company and that pays interest and principal to the lender in U.S. dollars would be considered a Eurobond. Thus, even if the bond is not issued in Europe, it merely needs to be sold in a country different from the one in whose currency it is denominated to be considered a Eurobond.</td>
</tr>
<tr>
<td><strong>Zero coupon and very low coupon bonds</strong> These bonds require either no coupon interest payments (these are called zeroes) or very low interest payments. Consequently, the bondholder receives all or most of their return at maturity. Since these bonds pay little or no interest they must sell at a deep discount. For the investor, a zero coupon bond is like a U.S. savings bond. The obvious appeal of zero coupon bonds is to those investors who need a lump sum of money at some future date but don’t want to be concerned about reinvesting interest payments. Today, zero coupon bonds are infrequently issued by corporations. The dominant player in this market is the U.S. government, with the government’s zero coupon bonds called STRIPS.</td>
</tr>
<tr>
<td><strong>Junk (high-yield) bonds</strong> High-risk debt that has a below investment-grade bond rating (see the earlier discussion of bond ratings). Junk bonds are also called high-yield bonds because they pay interest rates that are 3 to 5% higher than those of the highest rated bonds.</td>
</tr>
<tr>
<td><strong>Floating rate bonds</strong> A floating- or variable-rate bond is simply one whose coupon rate fluctuates according to the level of current market interest rates. These bonds are quite popular with municipalities and foreign governments, but are far less common among corporations.</td>
</tr>
<tr>
<td><strong>Convertible bonds</strong> Convertible bonds are debt securities that can be converted into a firm’s stock at a pre-specified price.</td>
</tr>
</tbody>
</table>
9.5 Determinants of Interest Rates

- Bond prices vary inversely with interest rates.
- To understand bond pricing we need to know the determinants of interest rates.
- Quotes of interest rates in the financial press are commonly referred to as the **nominal (or quoted) interest rates**.
- **Real rate of interest** adjusts the nominal rate for the expected effects of inflation.
The relationship between the nominal rate of interest, \( r_{\text{nominal}} \), the anticipated rate of inflation, \( r_{\text{inflation}} \), and the real rate of interest is known as the **Fisher effect**.

\[
1 + r_{\text{nominal}} = (1 + r_{\text{real}})(1 + r_{\text{inflation}})
\]

We can approximate the relation as

\[
r_{\text{nominal}} \approx r_{\text{real}} + r_{\text{inflation}}
\]
Example 9.3 What will be the real rate of interest if the nominal rate of interest is 10% and the anticipated rate of inflation is 3%?

- \((1+\text{nominal})=(1+\text{real})(1+\text{inflation})\)
- Hence, \(1+\text{real} = (1+\text{nominal})/(1+\text{inflation})\)
  \[= (1+.1)/(1+.03)=1.1/1.03=1.0680\]
- Real =1.0680-1=0.068=6.8%
- Or approximately, real=nominal-inflation= 10%-3% =7%.
Solving for the Real Rate of Interest

You have managed to build up your savings over the three years following your graduation from college to a respectable $10,000 and are wondering how to invest it. Your banker says they could pay you 5% on your account for the next year. However, you recently saw on the news that the expected rate of inflation for next year is 3.5%. If you are earning a 5% annual rate of return but the prices of goods and services are rising at a rate of 3.5%, just how much additional buying power would you gain each year? Stated somewhat differently, what real rate of interest would you earn if you made the investment?
Checkpoint 9.5: Check Yourself

- Answer:

Real = \frac{1+\text{nominal}}{1+\text{inflation}} - 1 = \frac{1.05}{1.035} - 1 = 1.45\%

- Assume now that you expect that inflation will be 5% over the coming year and want to analyze how much better off you will be if you place your savings in an account that also earns just 5%. What is the real rate of return in this circumstance?
Solving for the Nominal Rate of Interest

After considering a number of investment opportunities, you have decided that you should be able to earn a real return of 2% on your $10,000 in savings over the coming year. If the expected rate of inflation is expected to be 3.5% over the coming year, what nominal rate of return must you anticipate in order to earn the 2% real rate of return?
Checkpoint 9.6: Check Yourself

Answer:

Nominal = (1 + real)(1 + inflation) - 1

= 1.02 * 1.035 - 1 = 0.0557 = 5.57%

If you anticipate that the rate of inflation will now be 4% next year, holding all else the same, what rate of return will you need to earn on your savings in order to achieve a 2% increase in purchasing power?

Nominal = 6.08%
We can decompose a nominal interest rate into four components:

\[
\text{Nominal Rate of Interest} = \text{Real Rate of Interest, } r_{\text{real}} + \text{Inflation Premium} + \text{Default Premium} + \text{Maturity Premium}
\]

- Real rate, in terms of actual purchasing power – you can call this the time value of real money (real purchasing power).
- Inflation premium: Higher anticipated inflation leads to higher nominal rate, holding purchasing power constant.
- Default premium: If a bond has default risk, the interest rate will increase to compensate for this risk. The higher the default risk, the higher the default premium.
- Maturity premium: Long-term rates on average are higher than short-term rates.